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ENGELMANN SPRUCE BEETLE
INFESTATION IN THE
NORTHERN ROCKY MOUNTAIN REGION
1955

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During the past 4 years timber losses caused by an Engelmann spruce beetle outbreak have been very serious in northern Idaho and western Montana. In 1952 epidemic conditions occurred when Engelmann spruce beetle broods emerged from windthrown trees and attacked mature spruce timber in the spruce type over thousands of acres (figure 1). There were over 400 areas of spruce epidemically infested by the beetle. Pure spruce stands suffered the greatest damage; many were completely destroyed. The epidemic continued on an increasing scale and reached its peak during 1953. The first decline in the outbreak was noticed in 1954 and further reductions occurred in 1955.

During the course of the outbreak the spruce volume killed by the beetle has been compiled by the Division of Timber Management,^{1/} Forest Service Region One, for the eight infested national forests by years, of which about 15 percent has been logged:

1952	- - -	617	million ft. bm.		
1953	- - -	881	"	"	"
1954	- - -	590	"	"	"
1955	- - -	332	"	"	"
Total		2,420	"	"	"

SURVEYS

In the initial stages of this outbreak the Forest Insect Laboratory (then a field office of the former Bureau of Entomology and Plant Quarantine), whose responsibility it is to survey insect damage, lacked the facilities to appraise the extent of the outbreak. The National Forest Administration working under technical assistance of Laboratory entomologists assumed the responsibility for detection and operational surveys. Such surveys required thousands of mandays to detect, appraise, and prepare the necessary timber sale plans for logging control. The Forest Insect Laboratory conducted extensive ground surveys in inoperable areas, reserved stands, national parks, Indian lands and occasionally in privately-owned timber. The Laboratory also made many aerial surveys, first to detect outbreaks and later to delineate areas of infestation. During the past two years, it has continued to make different types of surveys, but more effort has been directed toward measuring the trend of the outbreak in undisturbed areas of infestation. From such data the normal course of the outbreak can be followed and, too, the effect of control in the logged areas can be compared.

^{1/} Clearwater, Colville, Coeur d'Alene, Flathead, Kaniksu, Kootenai, Lolo, and St. Joe.

As a measurement of the natural trend of the outbreak in undisturbed areas, (using the 1952 average board-foot volume killed as an index of 1) these surveys show the losses by years as:

<u>Year</u>	<u>Index</u>
1952 - - - -	1.0
1953 - - - -	1.9
1954 - - - -	1.6
1955 - - - -	.7

For all areas the trend would undoubtedly have been at a somewhat lower figure because of the influence of logging on many of the infested areas.

1955 SURVEYS

Surveys were made by the Forest Insect Laboratory in 30 Engelmann spruce stands during 1955 with one or more of four objectives: (1) detection surveys were made in a number of stands where the status was less than half Government-owned, (2) surveys were made at the request of the national forests concerned, (3) two areas were surveyed in an attempt to weigh the effects of logging control and (4) twelve areas were surveyed to show the normal trend of the spruce beetle outbreak on undisturbed areas (table 2). The basic data obtained on these surveys is given in table 1.

DETECTION SURVEYS

The 4 areas on which detection surveys were made lie in the Swan River Valley on the Flathead National Forest in Montana. The Laboratory has carried the responsibility of detection surveys in these areas because the timber stands are for the most part owned by the State and by private interests. The infestation in these areas has declined to the point where no further surveys will be made other than in the Soup Creek Compartment, No. 443 where infestation trend data will perhaps be obtained another year.

APPRAISAL SURVEYS

Appraisal surveys were made in 1955 largely at the request of national forests as a service to inform them of the status of the infestation in specific areas. An appraisal survey was also made on Indian lands in an area of infestation on the Flathead Indian Reservation in Montana. Two areas were surveyed on the Kootenai National Forest in an attempt to measure the effects of logging as a means of control. These areas are listed in table 1 as compartments 77 and 107.

Logging as a means of control has been practiced on a large scale wherever practical in the infested areas. Undoubtedly, benefits have occurred from these efforts, but the results in specific areas have been almost impossible to measure because the logging activities destroy evidence of previous infestation. The 2 areas listed were to be part of a number of compartments surveyed to show the results of logging as a means of control. No other areas were found, however, that fulfilled the qualifications and the 2 areas surveyed provided insufficient data for this purpose.

Appraisal surveys were made in 12 areas where no control activities had been undertaken. These areas were also surveyed in 1954 and therefore provide fairly sound data for the two-year period of 1952-1953 and data for each of the years 1954 and 1955. The results of the surveys on these areas provide data showing the normal trend of the outbreak (table 2). It is from such surveys that trend data as given on page 2 are compiled.

Data relative to the trend of the outbreak are also used to predict the estimated spruce timber volume that will be attacked during the coming year. This information provides a valuable tool to forest management where logging plans must be made well in advance to provide time for road construction and sales preparation. Formulas by which a rough prediction of future loss may be made have been developed for the past two years from trend surveys.^{1/}

The number of undisturbed areas of infestation become fewer each year and therefore there is a slight variation in the data obtained for past years; but considering the circumstances the data are remarkably uniform.

In the areas listed in table 1 the data for losses for all except the current year are listed under the single heading of 1952-1954. The volume data of the insect-killed trees were grouped because the characteristics of spruce trees killed by the Engelmann spruce beetle do not permit an accurate separation of trees killed by years prior to the current year.

^{1/} Terrell, Tom T., and McComb, David. Predicted tree mortality from the 1956 flight of the Engelmann spruce beetle in the Northern Region. Missoula Forest Insect Laboratory, Intermountain Forest and Range Experiment Station, Missoula, Montana, 1955. (Mimeographed)

Much of the basic data contained in this report has been made available through the Division of Timber Management of Region 1 as it was compiled. Maps showing the survey lines and the location of infested trees recorded on the lines will be sent to the various national forests.

SUMMARY

An outbreak of Engelmann spruce beetle attacked the spruce stands of the northern Rocky Mountain region in 1952, reached a peak of destruction in 1953, and started to decline in 1954. This decline continued in 1955. The outbreak was very destructive; nearly $2\frac{1}{2}$ billion board feet of spruce timber was killed during the four-year period. Pure spruce stands were hardest hit and many of them were completely destroyed.

Logging the infested and dead trees has been the principal means of combatting the outbreak and of salvaging the beetle killed trees.

In 1955 the Engelmann spruce beetle attacked approximately 330 million board feet of spruce: a little over half the volume infested in 1954.

The outlook for 1956 is for a continued decrease in the amount of infestation and the expectation that, in many Engelmann spruce stands, the infestation will reach a normal status.

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Engelmann Spruce Beetle Outbreak

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1954. Engelmann spruce beetle surveys in the Northern Region 1954. Coeur d'Alene Research Center, Intermountain Forest and Range Experiment Station, Forest Service, Coeur d'Alene, Idaho, December 15. 9 pp. (Processed).

Table 1.--Basic field data from Engelmann spruce beetle surveys 1955

Forest and compartment	Comp. no.	Acres surveyed	Percent sampled	Number of trees on survey sample					Average diameters in inches					Percentage of original volume					Purpose of survey
				Beetle attacked					Beetle attacked					Beetle attacked					
				'52-'54	1955	Total	Green	All	'52-'54	1955	Total	Green	All	'52-'54	1955	Total	Green		
<u>COLVILLE N. F., Wash.</u>																			
Upper Salmo River	108	1715	2.5	91	5	96	714	810	19.3	20.4	19.4	18.4	18.6	12.5	.7	13.2	86.8	Appraisal	
<u>FLATHEAD N. F., Mont.</u>																			
Hornet Creek	107	1110	4.7	38	1	39	844	883	17.6	18.0	17.6	17.2	17.2	4.6	.1	4.7	95.3	Appraisal	
So. Fk. Coal Creek	121	700	4.1	101	49	150	1031	1181	22.4	21.5	22.1	19.1	20.1	12.8	5.1	17.9	82.1	Trend	
Hallowatt Creek	128	1100	3.0	68	14	82	1075	1157	26.0	27.7	26.3	21.7	22.5	9.2	2.3	11.5	88.5	Trend	
Bunker Creek	329	5000	2.0	221	33	254	2266	2520	24.8	25.8	25.0	18.8	20.3	15.5	2.7	18.2	81.8	Appraisal	
Porcupine Creek	437	1900	2.4	9	0	9	1446	1455	24.7	-	24.7	20.5	20.5	.8	-	.8	99.2	Appraisal	
Soup Creek	443	990	-	26	1	27	601	628	28.8	30.0	28.8	20.3	22.9	10.5	.4	10.9	89.1	Trend & Detect.	
North Woodward	447	880	-	1	0	1	278	279	14.0	-	14.0	16.3	16.3	.2	-	.2	99.8	Detection	
Fatty Creek	451	2400	2.4	43	18	61	1803	1864	25.9	26.3	26.0	18.9	19.7	4.8	2.0	6.8	93.2	Trend & Appr.	
Piper Creek	453	862	3.9	43	9	52	687	739	25.2	23.8	24.9	21.4	21.9	8.1	1.6	9.7	90.3	Trend & Appr.	
Cold Creek	458A	490	4.0	171	60	231	342	573	27.5	19.2	25.4	18.1	21.7	53.6	8.7	62.3	37.7	Appraisal	
Lower Elk Creek	460	342	3.9	2	0	2	290	292	17.0	-	17.0	13.0	13.0	1.2	-	1.2	98.8	Appraisal	
Upper Elk Creek	460	552	-	50	9	59	427	486	24.8	20.4	24.2	20.1	22.8	16.2	1.4	17.6	82.4	Detection	
Windfall-Kraft Creek	461	1000	2.1	87	6	93	871	964	17.1	16.3	17.1	14.8	15.5	13.2	.6	13.8	86.2	Trend & Appr.	
" -Hemlock Creek	461	495	3.8	5	0	5	290	295	24.4	-	24.4	15.6	16.0	5.6	-	5.6	94.4	Appraisal	
" -Wild Area	461A	628	-	60	0	60	433	493	20.9	-	20.9	17.6	19.4	19.3	-	19.3	80.7	Detection	
Lion Creek	481	1400	3.8	93	28	121	1414	1535	24.4	22.9	24.0	16.9	18.5	14.0	3.0	17.0	83.0	Appraisal	
<u>KANIKSU N. F., Idaho</u>																			
Vermillion River	128	4300	2.4	145	12	157	1926	2083	24.1	20.3	23.8	17.4	18.4	14.4	.8	15.2	84.8	Appraisal	
Ball Creek	516A	450	4.2	81	13	94	495	589	21.3	17.7	20.8	17.0	18.2	23.2	2.5	25.7	74.3	Trend	
" "	516B	1600	3.6	28	3	31	1368	1399	20.1	14.0	19.5	15.8	16.0	3.8	.1	3.9	96.1	Appraisal	
<u>KOOTENAI N. F., Mont.</u>																			
Porcupine Creek	16	600	4.7	256	90	346	1003	1349	19.3	17.1	18.7	14.9	16.9	31.4	7.2	38.6	61.4	Trend	
So. Fk. Keeler Creek	63	1300	4.6	617	14	631	218	849	23.0	18.7	22.9	16.6	21.4	80.7	.9	81.6	18.4	Trend	
East Fk. Pipe Creek	77	1890	3.4	79	0	79	859	938	19.1	-	19.1	14.6	15.2	19.1	-	19.1	80.9	Logging Con.	
Pinkham Creek	107	2522	2.3	30	3	33	1472	1505	22.7	23.3	22.8	16.2	16.6	5.2	.6	5.8	94.2	Logging Con.	
Ten Mile Creek	108	640	4.7	216	51	267	591	858	22.4	19.0	21.8	16.0	18.6	44.3	6.1	50.4	49.6	Trend	
<u>LOLO N. F., Mont.</u>																			
Selway Bitterroot Wilderness Area	-	1700	5.1	720	330	1050	2142	3192	19.5	16.2	18.6	14.9	17.2	37.8	10.5	48.3	51.7	Trend	
<u>NEEPERCE N. F., Idaho</u>																			
Skookumchuck Creek	82	2050	5.0	58	3	61	1714	1775	16.3	16.0	16.3	15.2	15.3	3.6	.2	3.8	96.2	Appraisal	
<u>FLATHEAD INDIAN LANDS, Mont.</u>																			
Boulder Creek	-	3230	2.4	185	37	222	4127	4349	21.4	18.0	20.8	17.7	18.4	7.4	.9	8.3	91.7	Appraisal	
<u>GLACIER N. P., Mont.</u>																			
McDonald Creek	-	4200	1.8	506	142	648	1566	2214	24.0	21.2	23.0	17.5	20.1	37.9	8.3	46.2	53.8	Trend	
Total and averages		46,046	2.8 ^{1/2}	4,030	931	4,961	32,293	37,254	22.1	18.9	21.5	17.4	18.6	19.5	3.0	22.5	77.5		

1/ Applies to appraisal surveys only.

2/ Heads of Red Butte, Frenchy, and Hemlock Creeks.

Table 2.--Engelmann spruce beetle infestations in
uncontrolled areas

Forest and compartment	Compartment number	Percentage of original volume infested		
		1952-53 ^{1/}	1954 ^{1/}	1955
<u>FLATHEAD NATIONAL FOREST</u>				
S.Fk. Coal Creek (Mathias)	121	6.7	7.2	5.1
Hallowatt Creek (Kletonus)	128	5.0	1.7	2.3
Soup Creek	443	8.5	.5	.4
Fatty Creek	451	3.7	7.7	2.0
Piper Creek	453	7.7	5.1	1.6
Windfall Creek (Krutt)	461	6.6	4.7	.6
<u>KANIKSU NATIONAL FOREST</u>				
Ball Creek (Head)	516A	11.3	2.7	2.5
<u>KOOTENAI NATIONAL FOREST</u>				
Porcupine Creek	16	15.5	22.7	7.2
S.Fk. Keeler Creek	63	58.3	19.4	.9
Ten Mile Creek	108	32.4	22.8	6.1
<u>LOLO NATIONAL FOREST</u>				
Selway-Bitterroot Wilderness	-	21.0	11.2	10.5
<u>GLACIER NATIONAL PARK</u>				
McDonald Creek	-	30.3	18.5	8.3
Average percent of loss		17. ^{2/}	10.	4.

^{1/} Data from 1954 survey.

^{2/} This data may be interpreted as 6 percent for 1952 and 11 percent for 1953.



Figure 1. Principal Engelmann spruce stands in the Northern Rocky Mountain Region.